



Natural Heritage & Endangered Species Program

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Description: The marbled salamander is a short and stout salamander, with a stocky body, short limbs, and a broad, rounded snout. The dorsum has a dark brown to black background, splashed with bold silver-white or grey band-like markings that converge to create black spots—this “marbled” effect is what earned the salamander its common name. Unique among the New England salamanders, marbled salamanders exhibit sexual dichromatism; the males have brilliant white markings and the females have dull grey markings. Sometimes the cross-banding is incomplete, forming stripes on the back, sides, and tail. The ventral coloration is uniformly dark gray.

Recently-transformed juveniles, or metamorphs, average approximately 1.5 inches (4 cm) in total length and have a dark grey to brown coloration with tiny silver flecks scattered over the dorsal area. As the animal matures, these flecks elongate to form the characteristic adult pattern one to two months after metamorphosis. Adults vary in length from 3.5 to 4.25 inches (9 - 10.75 cm) with the males slightly shorter than females. The tail comprises about 40 percent of the total length of the body.

Similar species: Mature, adult marbled salamanders are very distinct, so confusion with other species is unlikely. However, juveniles are similar to juveniles of spotted salamanders (*Ambystoma maculatum*) and blue-spotted salamanders (*Ambystoma laterale*), but are distinguished by silver rather than gold or blue dorsal flecking.

Range: The marbled salamander’s range in New England includes southern New Hampshire, Massachusetts, Connecticut, and Rhode Island. From this northern extreme, the range broadens

Marbled Salamander *Ambystoma opacum*

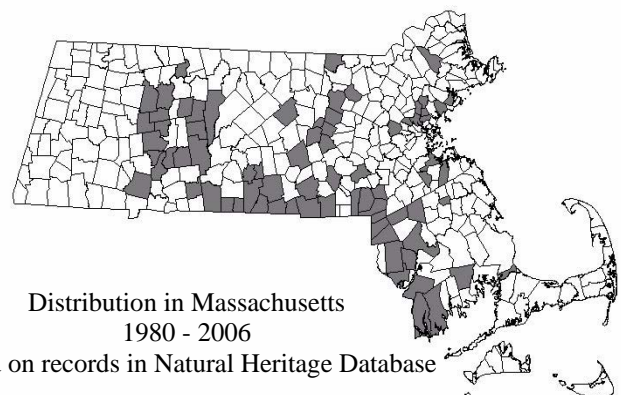
State Status: **Threatened**
Federal Status: None



Photo by Lloyd Gamble

greatly extending down through southern New York and central Pennsylvania, west to southern Illinois and down through the Mississippi basin to eastern Oklahoma and eastern Texas. The eastern border extends south throughout the Southeast down to northern Florida and through the Gulf states.

Habitat: Marbled salamanders are largely terrestrial and generally occur in deciduous to mixed woods of the southern hardwood type, dominated by oak and hickory species with white pine. They can live in a variety of habitats including moist, sandy areas and dry hillsides. They hide beneath surface materials such as logs, bark, boards, stones, and drift that piles up along the margins of streams. Wooded vernal pools or shallow depressions are required as breeding sites.



Distribution in Massachusetts
1980 - 2006

Based on records in Natural Heritage Database

Life Cycle / Behavior: Unlike most other *Ambystoma* species which breed in the spring (mid-March to April), marbled salamanders breed and deposit their eggs in autumn (September to October) in dry vernal pools. During the late summer, on nights just after heavy rainfall, adults migrate to the edges of dry vernal pools and congregate under the leaf litter. Males generally arrive at the breeding sites a few days prior to the females. Courtship occurs on land, involving circular “dancing” and snout-to-vent nuzzling. This activity induces the males to deposit a gelatinous spermatophore (a tiny packet of sperm) on the ground which is then picked up and stored in the female’s cloaca for internal fertilization. Eggs are spherical and opaque, between 2.7 and 5 mm in diameter. Numbering between 50 and 150, the eggs are deposited individually in a nest, usually in a small cavity under a log or leaf litter on the bottom of a vernal pool depression. They are almost invariably flooded when autumnal rainwater fills the pool. The moist eggs become covered with leaf detritus and become difficult to detect. The female remains to guard the eggs, curling her body protectively around them until they hatch.

Eggs hatch within a few days after water fills the depression. Newly-hatched larvae are 3/4 inch (1.9 cm) in length in the fall and remain active through the winter under the ice, growing slowly. If the pool doesn’t fill, the female will leave the eggs for an underground wintering lair. Eggs are capable of withstanding extended desiccation without mortality, and in some cases, may overwinter to hatch the following spring. Larvae from eggs that overwinter grow larger before hatching, emerging at a full inch long. In the spring, growth accelerates for all larvae as temperatures increase and food items become more abundant. Larvae are voracious eaters, preying on copepods, aquatic insects and their larvae, other amphibian larvae, and even each other.

The schedule of larval metamorphosis is largely dependent on vernal pool water levels or hydroperiod during summer. In years of high water, larvae will remain in the pool longer, sometimes until fall, before transforming; the recently-metamorphosed juveniles will be leaving the pond, as the adults begin arriving to breed. Juveniles take 15-18 months to reach breeding size.

Marbled salamanders have been found to migrate to and from breeding pools an average of 100 to 900 feet

from their terrestrial habitat. The maximum known movement distance by a marbled salamander is 4034 feet (1230 m), and was traveled by a juvenile in Massachusetts.

Adult marbled salamanders feed on small invertebrates such as larval and adult insects, crustaceans, snails, earthworms, slugs, beetles and ants. They are nocturnal and generally less active than other salamander species. Adults have a distasteful milky secretion from the tail that protects them from potential predators.

Population status in Massachusetts: The marbled salamander is currently listed as a “Threatened Species” in Massachusetts. There are 75 towns in Massachusetts where marbled salamanders have been observed. Seventy-eight occurrences have been documented since 1981, as well as 27 historic occurrences that were documented prior to 1981. The fact that the marbled salamander is near the northern limit of its range in Massachusetts is a contributing factor to its rarity in the state. Furthermore, the species is difficult to locate and census accurately. Although marbled salamanders are widespread throughout Massachusetts lowlands, populations tend to be very small and localized, surrounding vernal pool breeding areas. For yet unknown reasons, many vernal pools do not support them. The major threat to this species—and most salamanders in general—is the loss, degradation and fragmentation of both aquatic breeding pool habitat required for reproduction and terrestrial habitat needed for foraging, overwintering, growth and development to development and urbanization. Some population declines may be attributed to over collection, heavy road traffic, and pesticides or other toxic chemicals polluting breeding pool water.

Management Recommendations: In order to ensure the survival of this species in Massachusetts, the following recommendations regarding habitat preservation are suggested. There are two critical components in the life history of this species: the vernal pool habitat required for reproduction, and the upland forest habitat required for foraging, hibernation and other terrestrial and fossorial activities. Conservation of the marbled salamander (and all native members of the genus *Ambystoma*) must therefore focus on the preservation of vernal pools and small ponds known to be inhabited by this species, as well as a significant parcel (250 - 1600 meter radius) of upland habitat surrounding such breeding sites. Provided these habitats are not significantly degraded (and that the salamanders

are not subject to illegal collection or high road mortality), the salamander populations should be capable of maintaining themselves indefinitely.

However, it should be kept in mind that every population is unique. The majority of the populations, for instance, may be concentrated in a relatively small and discrete upland habitat, which would safely allow carefully conducted development within some portions of the “uninhabited” habitat around the breeding pool without serious effects on the population. The only way to determine if such a case exists, however, is through a detailed environmental study conducted by a qualified researcher(s) over a series of years, charting the movements of the animals to and from the breeding site. Unless such a study is conducted, it should be assumed that the salamanders are relatively evenly distributed around the pool and development should be strongly discouraged within a minimum radius of 500 - 1,000 meters surrounding the breeding pool.

Vernal pools and other breeding ponds must be protected not only from draining, filling and development, but also from degradation in the form of road and lawn run-off. If forestry practices are conducted within surrounding areas, a no-cut buffer zone of 50 to 100 feet should be established around the pool depression, and no slash or other debris should be dumped in the depression. Vernal pools receive some protection under the Massachusetts Wetlands Protection Act and several vernal pool species (including the marbled salamander) are protected under the Massachusetts Endangered Species Act. Efforts should be made to certify all vernal pools, and to enhance and promote the enforcement of the laws mentioned above. Because of their ephemeral nature, vernal pools are often difficult to locate during dry periods, and may be inadvertently damaged if their locations are not surveyed and marked prior to forestry or construction operations.

Citizens must be encouraged to recognize and report marbled salamanders and the locations of their breeding pools. Due to the rarity of this species, its ephemeral terrestrial occurrence, and its very specific habitat requirements, some populations undoubtedly remain undiscovered and therefore under protected.

References:

Bol, L. (2006). Massachusetts Forestry Conservation Management Practices for MESA-Listed Mole Salamanders, Natural Heritage and Endangered Species Program, Westborough, MA.

DeGraaf, R.M. and M. Yamasaki. (2001). New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England, Hanover, NH.

Gamble, L.R. (2004). Landscape-level population structure and local variability in marbled salamanders (*Ambystoma opacum*) of western Massachusetts: Applied lessons from metapopulation theory. M.S. Thesis. University of Massachusetts, Amherst, MA, USA.

Kenney, L. P., and M. R. Burne. (2001). A Field Guide to the Animals of Vernal Pools. Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program and Vernal Pool Association, Westborough, Massachusetts.

Noble, G. K., and M. K. Brady. (1933). Observations on the life history of the marbled salamander, *Ambystoma opacum*. **Zoologica** 11:89-132.

Petranka, J. W. (1998). Salamanders of the United States and Canada. Smithsonian Institution Press, Washington and London.